

provide a more economic and/or less awkward system for connecting together a sanding tool body and an abrasive material sheet.

All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that

- 5 any reference constitutes prior art. The discussion of the references states what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinency of the cited documents. It will be clearly understood that, although a number of prior art publications are referred to herein, this reference does not constitute an admission that any of these documents form part of the common
- 10 general knowledge in the art, in New Zealand or in any other country.

- It is acknowledged that the term 'comprise' may, under varying jurisdictions, be attributed with either an exclusive or an inclusive meaning. For the purpose of this specification, and unless otherwise noted, the term 'comprise' shall have an inclusive meaning - i.e. that it will be taken to mean an inclusion of not only the
- 15 listed components it directly references, but also other non-specified components or elements. This rationale will also be used when the term 'comprised' or 'comprising' is used in relation to one or more steps in a method or process.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

20 **DISCLOSURE OF INVENTION**

In a first aspect, the invention consists in an abrasive tool comprising:

a base portion, and

a plastics film layer on said base portion adapted to receive an abrasive material layer.

Preferably, said base portion includes a foam layer to which said plastics film layer is applied.

Preferably, an abrasive material layer is applied to said plastics film layer.

Preferably, said abrasive material layer comprises abrasive material fixed to a  
5 backing layer wherein the backing layer is applied to the plastics film layer.

Preferably, said backing layer is provided with an adhesive to attach the abrasive material layer to the plastics film layer.

Preferably, the adhesive is a pressure sensitive adhesive.

Preferably, said foam layer is formed from ethyl vinyl acetate foam or polyethylene  
10 foam or polypropylene foam.

Preferably, said plastics film layer is formed from ethyl vinyl acetate film or polyethylene film or polypropylene.

Preferably, said plastics film layer is applied to said foam layer by laminating during formation of the foam layer.

15 Preferably, a handle is connected to the base portion of the tool.

Preferably, the base portion is substantially planar.

Preferably, the base portion is flexible and means are provided on the tool for adjusting the curvature of the base portion and fixing the curvature of the base portion once adjusted.

20 Preferably, said curvature of the base portion may be concave or convex.

Preferably, said base portion is connected to a handle portion about a central pivot line and adjustment means are provided at respective spaced apart ends of

the handle portion to allow the ends of the base portion to be moved closer to or further away from the respective ends of the base portion.

Preferably, each said adjustment means has a pivotable connection with a respective end of the base portion.

- 5 Preferably, each said adjustment means comprises a screw member passing through a respective end of the handle portion and received within a socket pivotably connected to a respective end of the base portion.

Preferably, each socket is pivotable about a rod fixed within an end of the base portion, wherein the rod is fixed to the base portion substantially across the entire  
10 width of the base portion.

In a second aspect, the invention consists in an abrasive tool comprising:

a handle portion,

a flexible base portion connected to the handle portion about a central pivot line, and

- 15 adjustment means between the handle and base portions for adjustably fixing the curvature of the base portion.

Preferably, said curvature of the base portion may be concave or convex.

Preferably, said base portion is connected to the handle portion about a central pivot line and adjustment means are provided at respective spaced apart ends of  
20 the handle portion to allow the ends of the base portion to be moved closer to or further away from the respective ends of the base portion.

Preferably, each said adjustment means has a pivotable connection with a respective end of the base portion.

Preferably, each said adjustment means comprises a screw member passing through a respective end of the handle portion and received within a socket pivotably connected to a respective end of the base portion.

Preferably, each socket is pivotable about a rod fixed within an end of the base portion, wherein the rod is fixed to the base portion substantially across the entire width of the base portion.

Preferably, a plastics film layer is provided on the outer surface of the base portion.

Preferably, the base portion includes a foam layer to which said plastics film layer is applied.

Preferably, an abrasive material layer is applied to said plastics film layer.

Preferably, said abrasive layer comprises abrasive material fixed to a backing layer wherein the backing layer is applied to the plastics film layer.

Preferably, said backing layer is provided with an adhesive to attach the abrasive material layer to the plastics film layer.

Preferably, the adhesive is a pressure sensitive adhesive.

Preferably, said foam layer is formed from ethyl vinyl acetate foam or polyethylene foam or polypropylene.

Preferably, said plastics film layer is formed from ethyl vinyl acetate film or polyethylene film or polypropylene.

Preferably, said plastics film layer is applied to said foam layer by laminating during formation of the foam layer.

#### **BRIEF DESCRIPTION OF DRAWINGS**

Further aspects of the present invention will become apparent from the ensuing description which is given by way of example only and with reference to the accompanying drawings in which:

- 5            Figure 1A       illustrates a side elevational view of one embodiment of a sanding tool incorporating an abrasive holder system according to the present invention;
- Figure 1B       illustrates a plan view of a sanding tool Figure 1A;
- Figure 1C       illustrates an end elevational view of a sanding tool Figure 1A;
- 10           Figure 2A       illustrates a side elevational view of a second embodiment of a sanding tool in accordance with the present invention;
- Figure 2B       illustrates a plan view of the sanding tool illustrated in Figure 2A;
- Figure 2C       illustrates an end elevational view of the sanding tool illustrated in Figure 2A;
- 15           Figure 3A       illustrates a side elevational view of a third embodiment of a sanding tool in accordance with the present invention;
- Figure 3B       illustrates a plan view of the sanding tool illustrated in Figure 3A;
- Figure 3C       illustrates an end elevational view of the sanding tool illustrated in Figure 3A;
- 20           Figure 4A       illustrates a side elevational view of a fourth embodiment of a sanding tool in accordance with the present invention in an alternative configuration to Figures 1A, 2A or 3A;
- Figure 4B       illustrates a plan view of the sanding tool illustrated in Figure 4A;

- Figure 4C illustrates an end elevational view of the sanding tool illustrated in Figure 4A;
- Figure 5A illustrates a side elevational view of a fifth embodiment of a sanding tool according to the present invention;
- 5 Figure 5B illustrates a plan view of the sanding tool illustrated in Figure 5A;
- Figure 5C illustrates an end elevational view of the sanding tool illustrated in Figure 5A;
- Figure 6A illustrates a side elevational view of a further aspect of a sanding tool according to the present invention;
- 10 Figure 6B illustrates an underneath view of Figure 6A with sandpaper removed.
- Figure 7A illustrates a side elevational view of a second embodiment of the further aspect of a sanding tool according to the present invention;
- Figure 7B illustrates an underneath view of Figure 7A with sandpaper removed.
- 15
- Figure 8A illustrates a plan view of an sixth embodiment of a sanding tool according to the present invention;
- Figure 8B illustrates a side elevational view of Figure 8A with sandpaper removed.

20 **BEST MODES FOR CARRYING OUT THE INVENTION**

With reference to Figures 1A, 1B and 1C there is shown a first embodiment of a sanding tool incorporating an abrasive system according to the present invention. The sanding or abrasive tool includes a handle 1 having a planar support base 2

onto which is attached a foam material 3, for example EVA, polypropylene or polyethylene or other suitable foam material. A durable film 4 such as EVA, polypropylene or polyethylene or other plastics film is glued or laminated or bonded onto the outer face of foam layer 3 and a layer of abrasive material 5 such as sandpaper is adhered to the film layer 4.

The sandpaper layer 5 may be adhered to the film layer 4 by a pressure sensitive adhesive applied to the back side of the sandpaper which allows the sandpaper to stick (and hold fast to) the film 4. The sandpaper layer 5 may also desirably allow peeling of the sandpaper from film 4 either after use or as and when required such as when the abrasive material on the front face of the sandpaper is worn down, or a different grade of sandpaper is required.

With reference to Figures 2a, 2b and 2c, there is shown a second embodiment of the sanding tool according to the present invention. The second embodiment is very similar to the first embodiment except for an alternatively shaped handle 1.

Similarly, Figures 3, 3a and 3b illustrate a third embodiment of a sanding tool according to the present invention, which utilises a swivel handle 13 connected to a base plate 1 having a planar support base 2 to attach suitable foam material.

Figures 4a, 4b, 4c and 5a, 5b and 5c illustrate fourth and fifth embodiments of hand-held sander tools which may utilise the foam, film, abrasive material laminate configuration described with reference to the first to third embodiments but with alternatively shaped handle and/or support base shapes.

Figures 6a and 6b illustrate a further embodiment of the present invention including a handle 1b additionally providing a bendable and adjustable support base portion 2b onto which is attached suitable foam material 3 (for example EVA or other suitable foam material) and onto which a suitably durable film 4 may be glued or laminated. The film 4 is applied to the foam layer 3 to allow abrasive

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sandpaper or the like having suitable pressure sensitive or other types of adhesive applied to one side thereof, to stick and hold the sandpaper to the film 4.

- As mentioned previously, the sandpaper/abrasive may also be able to be releasable from film 4 by peeling said sandpaper therefrom, as and when
- 5 required. Adjusting screws 7 are also provided to adjust the convex curve of the support base 2b for sanding inside curved corners. Attachment of mounting points 8 may also be provided in such an embodiment, thereby allowing the base 2b to be adjustable in shape, allowing for a flat, convex or concave sanding surface. The foam (and film layers 4) can in this way be connected in such a way
- 10 to a sander tool as to utilise the foam/film layer flexibility and flex the materials about the base 2b, or any curved position or base 2b shape as dictates by the adjustable screws 7. The base 2b may also be connected to the hand tool by points 8 (which may be in the form of a tongue-in-groove or key in slot configuration). Adjustable screws 7 may connect via connection point 10 with an
- 15 axle 9 extending substantially the width of the base 2b. The position of such an axel allows uniform pressure to be maintained along the width edge of the foam/film/base layers. The connection point 10 may be in the form of a universal ball joint or similar which allows the base 2b and attachment layers 3,4 to rotate relative to the body of the tool 16 in sympathy with a surface being sanded.
- 20 With reference to Figures 7a and 7b there is shown a further preferred embodiment of the present invention in the form of an abrasive holder handle 1c, a flat bendable and adjustable base portion 2c on to which is attached suitable foam material 3 and to which a suitably durable film 4 is glued or laminated. Abrasive sandpaper 5 may then be adhered to film 4 and preferably be easily
- 25 releasable therefrom by peeling as and when required. Adjustment means 11 such as an adjustable screw (similar to adjustable screw 7) may be utilised in a similar fashion to the embodiment illustrated in figures 6a, 6b and as previously



described. Such an adjustable screw may be connected to an axle 9 substantially extending the width of the base 2b via a universal connection joint. In particular this embodiment of an abrasive tool (and holder) may be utilised for the sanding of concave surfaces; where screws 7 may be extended to push the base 2b connected at points 9, 10 away from the tool body 1c, whilst a central portion of the base 2b remains fixed at 14.

With reference to Figures 8a and 8b there is shown a further embodiment of the present invention in the form of a file including a handle 12, a flat stiff or flexible base 2 to attach suitable foam material 3 (such as EVA or other suitable foam material) and to which a suitably durable film 4 is glued or applied or laminated. An abrasive material such as sandpaper 5 is applied to film 4 preferably in such a way that the sandpaper abrasive is easily releasable from the film 4 by peeling said off and when required. A suitable flat or handled sanding tool for the purpose of filing human nails, or animal nails or hoofs is thereby provided.

Although not shown, it should be appreciated that the tool could be formed from a solid or composite body made entirely from EVA, or Polyethylene, or rubber, or cork, or composite materials, or any other suitable materials, and where a film layer can be laminated directly to the flat base of the body. Abrasives having pressure sensitive adhesive applied to one side can then be applied to, and easily removable from, the film layer. The block of, for example, EVA, could be moulded to form a handle so that the tool looks much like the tool shown in Figures 1a to 1c.

In the above described embodiments there is provided a series of sanding tools having square, rectangular, triangular, oval, or any suitable shaped base to which a layer of foam such as Ethyl Vinyl Acetate (EVA), or Polyethylene (PE), or any other suitable foam can be glued. A handle may be attached to the upper side of the base of the tool by which to push, pull, and move the tool to perform sanding.

The EVA foam, or PE foam, or any other suitable foam will have a suitable plastics film such as Polyethylene film, or any other suitable film laminated thereto. This laminated film creates a much more durable surface on the EVA foam onto which abrasives coated with any suitable adhesive (such as pressure sensitive adhesive) can be stuck and applied to. Preferably, pressure sensitive adhesive backed sandpaper abrasive can be easily peeled off and released from the film laminated side of the foam.

The film layer laminated to the foam layer could also be imprinted with branding or any suitable printed information on the side of the film to be laminated to the foam, thereby providing branding or printing that is free from wear and tear or damage. The EVA or other suitable foam adhered to the base can be of any suitable thickness from less than about 1mm thick to about 25mm thick or more.

While it is desirable to apply plastics film to the foam, the foam could alternatively have any suitable coating applied to its surface which would create a surface suitable for attaching, adhering and removing abrasives with a suitable adhesive. The abrasive material could have any suitable and removable waxed paper, or any other suitable removable protective backing paper or film applied thereto to enable peeling from the film layer.

As mentioned above in relation to Figures 6 and 7, the abrasive holders or sanding tools according to the present invention may have adjustable bases that can be adjusted to create either a concave or convex curve to conform to fit any curved surface to be sanded.

The present invention is not limited to hand tools but may also be used in electric sanding tools. It should also be noted that the film layer may be applied directly to the bottom base of the sanding tool without the need for the foam layer where the tool may be made entirely from rubber, synthetic compound, cork, or any other

suitable material including composite materials to provide the necessary elasticity to the sandpaper. The file embodiment of Figures 8a and 8b may have a flat thin base with rounded or square or other shaped ends.

5 The EVA foam pad preferably has a thickness of between approximately 0.5mm and 25mm, and the foam may be of a density ranging from 20 to over 200 kg.m<sup>-3</sup>. The film layer may be applied to the foam layer or directly to the base of the tool with any suitable glue or heat laminating or other suitable application system. Abrasive material such as sandpaper having a suitable pressure sensitive adhesive (PSA) applied to one side thereof can be attached to the film layer by  
10 peeling the protective backing paper from the PSA side of the sandpaper and sticking the sandpaper to the film layer.

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof as defined in the appended claims.

**WHAT WE CLAIM IS:**

1. An abrasive tool comprising:  
  
a base portion, and  
  
a plastics film layer on said base portion adapted to receive an abrasive  
5 material layer.
2. An abrasive tool as claimed in claim 1, wherein said base portion  
includes a foam layer to which said plastics film layer is applied.
3. An abrasive tool as claimed in claim 1 or claim 2, wherein an abrasive  
material layer is applied to said plastics film layer.
- 10 4. An abrasive tool as claimed in claim 4, wherein said abrasive layer  
comprises abrasive material fixed to a backing layer wherein the backing  
layer is applied to the plastic film layer.
5. An abrasive tool as claimed in any one of the preceding claims, wherein  
said backing layer is provided with an adhesive to attach the abrasive  
15 material layer to the film layer.
6. An abrasive tool as claimed in claim 5, wherein the adhesive is a  
pressure sensitive adhesive.
7. An abrasive tool as claimed in any one of the preceding claims, wherein  
said foam layer is formed from ethyl vinyl acetate foam or polyethylene  
20 foam or polypropylene foam.

8. An abrasive tool as claimed in any one of the preceding claims, wherein said plastics film layer is formed from ethyl vinyl acetate film or polyethylene film or polypropylene film.
- 5 9. An abrasive tool as claimed in any one of the preceding claims, wherein said plastics film layer is applied to said foam layer by laminating during formation of the foam layer.
10. An abrasive tool as claimed in any one of the preceding claims, wherein a handle is connected to the base portion of the tool.
- 10 11. An abrasive tool as claimed in any one of the preceding claims, wherein the base portion is substantially planar.
12. An abrasive tool as claimed in any one of the preceding claims, wherein the base portion is flexible and means are provided on the tool for adjusting the curvature of the base portion and fixing the curvature of the base portion once adjusted.
- 15 13. An abrasive tool as claimed in claim 12, wherein said curvature of the base portion may be concave or convex.
14. An abrasive tool as claimed in claim 12 or claim 13, wherein said base portion is connected to a handle portion about a central pivot line and adjustment means are provided at respective spaced apart ends of the handle portion to allow the ends of the base portion to be moved closer  
20 to or further away from the respective ends of the base portion.
15. An abrasive tool as claimed in claim 14, wherein each said adjustment means has a pivotable connection with a respective end of the base portion.

16. An abrasive tool as claimed in claim 14 or claim 15, wherein each said adjustment means comprises a screw member passing through a respective end of the handle portion and received within a socket pivotably connected to a respective end of the base portion.
- 5 17. An abrasive tool as claimed in claim 16, wherein each socket is pivotable about a rod fixed within an end of the base portion, wherein the rod is fixed to the base portion substantially across the entire width of the base portion.
18. An abrasive tool comprising:
- 10 a handle portion,
- a flexible base portion connected to the handle portion about a central pivot line, and
- adjustment means between the handle and base portions for adjustably fixing the curvature of the base portion.
- 15 19. An abrasive tool as claimed in claim 18, wherein said curvature of the flexible base portion may be concave or convex.
20. An abrasive tool as claimed in claim 18 or claim 19, wherein said flexible base portion is connected to the handle portion about a central pivot line and adjustment means are provided at respective spaced apart ends of
- 20 the handle portion to allow the ends of the flexible base portion to be moved closer to or further away from the respective ends of the flexible base portion.

21. An abrasive tool as claimed in any one of claims 18 to 20, wherein each said adjustment means is a pivotable connection with a respective end of the flexible base portion.
22. An abrasive tool as claimed in any one of claims 18 to 21, wherein each said adjustment means comprises a screw member passing through a  
5       respective end of the handle portion and received within a socket pivotably connected to a respective end of the flexible base portion.
23. An abrasive tool as claimed claim 22, wherein each socket is pivotable about a rod fixed within an end of the flexible base portion, wherein the  
10       rod is fixed to the flexible base portion substantially across the entire width of the flexible base portion.
24. An abrasive tool as claimed in any one of claims 18 to 21, wherein a plastics film layer is provided on the outer surface of the flexible base portion.
- 15   25. An abrasive tool as claimed in claim 24, wherein the flexible base portion includes a foam layer to which said plastics film layer is applied.
26. An abrasive tool as claimed in claim 24 or claim 25, wherein an abrasive material layer is applied to said plastics film layer.
27. An abrasive tool as claimed in claim 26, wherein said abrasive material  
20       layer comprises abrasive material fixed to a backing layer wherein the backing layer is applied to the plastics film layer.
28. An abrasive tool as claimed in claim 27, wherein said backing layer is provided with an adhesive to attach the abrasive material layer to the plastics film layer.

29. An abrasive tool as claimed in claim 28, wherein the adhesive is a pressure sensitive adhesive.
30. An abrasive tool as claimed in any one of claims 25 to 29, wherein said foam layer is formed from ethyl vinyl acetate foam or polyethylene foam or polypropylene foam.
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31. An abrasive tool as claimed in any one of claims 24 to 30, wherein said plastics film layer is formed from ethyl vinyl acetate film or polyethylene film or polypropylene film.
32. An abrasive tool as claimed in any one of claims 24 to 31, wherein said plastics film layer is applied to said foam layer by laminating during formation of the foam layer.
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33. An abrasive tool substantially as hereinbefore described and as illustrated with reference to the accompanying drawings.